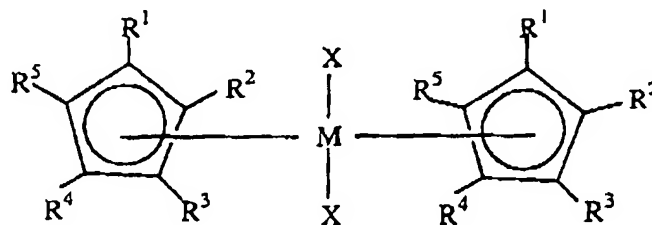


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LISTING OF CLAIMS

This listing of the claims will replace all prior versions and listing of claims in the application.

1. (original) An opto-electroactive device comprising a metallocene of the formula



wherein M is zirconium or hafnium; X is halogen and  $R^1$ - $R^5$  are each independently hydrogen, aryl, alkyl, halogen or  $-\text{Si}(\text{R}^6)_3$ ; or wherein at least two adjacent R substituents on at least one ring are joined to form a fused ring, which may be unsubstituted or substituted with aryl, alkyl, halogen or  $-\text{Si}(\text{R}^6)_3$ ; or wherein the  $R^1$  substituents on each ring are joined via a bridging ansa group, and

wherein  $R^6$  is an alkyl group, a substituted alkyl group, an aryl group or a substituted aryl group.

2. (original) The opto-electroactive device of claim 1, wherein X is fluoro, chloro or bromo, and  $R^1$ - $R^5$  are each hydrogen.

3. (original) The opto-electroactive device of claim 1, wherein X is fluoro, chloro or bromo, and the  $R^1$  substituents on each ring are joined to link the rings via a bridging ansa group, wherein the bridging ansa group is  $-\text{E}(\text{R}^6)_2$  wherein E is carbon, silicon, or germanium, and  $R^6$  is selected from the group consisting of alkyl, substituted alkyl, methyl, aryl and substituted aryl.

4. (original) The opto-electroactive device of claim 3, wherein X is chloro and E is silicon.

5. (original) The opto-electroactive device of claim 1, which comprises a zirconocene.

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6. (original) The opto-electroactive device of claim 5, wherein the zirconocene has a HOMO value of less than or equal to minus 6 electron volts.

7. (original) The opto-electroactive device of claim 5, wherein the zirconocene is phosphorescent.

8. (original) The opto-electroactive device of claim 1, which comprises a hafnocene.

9. (original) The opto-electroactive device of claim 1, which is an electroluminescent device, an LED, an OLED, a photovoltaic device, a photoconductor, a photodetector, or in a chemical or biochemical sensor.

10. (original) The opto-electroactive device of claim 1, wherein the metallocene is present in a light-emitting layer and the device emits light in the wavelength range of about 300 nm to about 1200 nm; or wherein the metallocene is present in a hole-blocking layer.

11. (original) The opto-electroactive device of claim 1, wherein the metallocene is present in a light-absorbing layer and the device absorbs light in the wavelength range of about 300 nm to about 1200 nm.

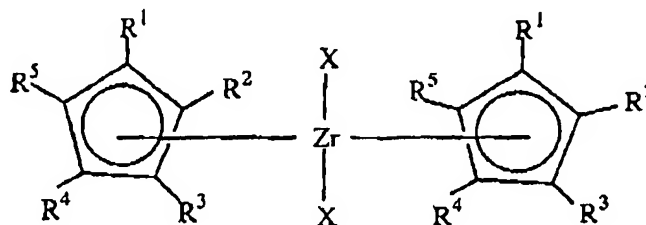
12. (original) The opto-electroactive device of claim 1, wherein the metallocene is present in the form of a composite comprising at least one metallocene and at least one polymeric or non-polymeric conductor.

13. (original) The opto-electroactive device of claim 12, wherein the polymeric conductor comprises at least one of poly(9-vinylcarbazole) or poly(phenylsilane).

14. (original) The opto-electroactive device of claim 12, wherein the non-polymeric conductor at least one of an aryl-substituted oxadiazole, an aryl-substituted phenanthroline, a benzoxazole, a benzthiazole, an aryl-substituted triazole, or 3-(4'-tert-butylphenyl)-4-phenyl-5-(4'-biphenyl)-1,2,4-triazole.

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15. (original) An opto-electroactive device comprising: (a) an anode; (b) a cathode; and (c) a layer comprising a zirconocene of the formula



wherein X is halogen and  $R^1$ - $R^5$  are each independently hydrogen, aryl, alkyl, halogen or  $-\text{Si}(\text{R}^6)_3$ ; or wherein at least two adjacent R substituents on at least one ring are joined to form a fused ring, which may be unsubstituted or substituted with aryl, alkyl, halogen or  $-\text{Si}(\text{R}^6)_3$  wherein  $\text{R}^6$  is an alkyl group, a substituted alkyl group, an aryl group or a substituted aryl group; or wherein the  $\text{R}^1$  substituents on each ring are joined to link the rings via a bridging ansa group; and

wherein the layer (c) is a light-emitting layer and the device emits light in the wavelength range of about 300 nm to about 1200 nm; or wherein the layer (c) is a light-absorbing layer and the device absorbs light in the wavelength range of about 300 nm to about 1200 nm; or wherein the layer (c) is a hole-blocking layer.

16. (original) The opto-electroactive device of claim 15, wherein X is fluoro, chloro or bromo, and  $\text{R}^1$ - $\text{R}^5$  are each hydrogen.

17. (original) The opto-electroactive device of claim 15, wherein X is fluoro, chloro or bromo, and the  $\text{R}^1$  substituents on each ring are joined to link the rings via a bridging ansa group, wherein the bridging ansa group is  $-\text{Si}(\text{R}^6)_2$  wherein  $\text{R}^6$  is selected from the group consisting of alkyl, substituted alkyl, methyl, aryl and substituted aryl.

18. (original) The opto-electroactive device of claim 15, which is an electroluminescent device, an LED, an OLED, a photovoltaic device, a photoconductor, a photodetector, or in a chemical or biochemical sensor.

19. (original) The opto-electroactive device of claim 15, wherein the zirconocene is phosphorescent.

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20. (original) The opto-electroactive device of claim 15, wherein the zirconocene is present in the form of a composite comprising at least one zirconocene and at least one polymeric or non-polymeric conductor.

21. (original) The opto-electroactive device of claim 20, wherein the polymeric conductor comprises at least one of poly(9-vinylcarbazole) or poly(phenylsilane).

22. (original) The opto-electroactive device of claim 20, wherein the non-polymeric conductor comprises at least one of an aryl-substituted oxadiazole, an aryl-substituted phenanthroline, a benzoxazole, a benzthiazole, an aryl-substituted triazole, or 3-(4'-tert-butylphenyl)-4-phenyl-5-(4"-biphenyl)-1,2,4-triazole.

23. (original) A method for making an opto-electroactive device comprising a zirconocene of claim 1, which comprises the step of applying the metallocene by vacuum deposition or from solution.

24. (original) A method for making an opto-electroactive device comprising a zirconocene of claim 15, which comprises the step of applying the zirconocene by vacuum deposition or from solution.